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Ms. Stokes
Customer Service
U.S. Patent and Trademark Office
Washington, D.C. 20231

Via Facsimile 703 308-2840

Re: Serial No. 08/694,397 now U.S. Patent No. 5,900,195
Divisional application filed from Serial No. 08/694,397

Dear Ms. Stokes:

Pursuant to your telephone request this morning attached are the following:

1. Copy of the postcard showing receipt by the Patent Office of the divisional application;
2. Copy of the check;
3. Copy of the CPA Application request (2 pages);
4. Copy of the application and drawings (22 pages);
5. Copy of the Declaration;
6. Copy of the Verified Statement-Small Business Concern
7. Copy of Preliminary Amendment (2 pages); and
8. Copy of the Information Disclosure Statement & 1449 (2 pages).

If you need anything further or have any questions, my phone number is 713 223-2900, ext. 2749.

Very truly yours,

Bracewell & Patterson, L.L.P.

Kay Clavenna

Kay Clavenna, PLS
Secretary to Albert B. Kimball Jr.

Enclosures

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03/26/98

Applicant or Patentee: PAUL L. POOL and WILLIAM H. GOWAN Attorney's
Serial or Patent No.: _____ Docket No.: A96006US
Filed or Issued: _____
For: PROTECTION OF PIPELINE JOINT CONNECTIONS

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY
STATUS (37 CFR 1.9(f) and 1.27(c)) - SMALL BUSINESS CONCERN

I hereby declare that I am

- ☐ the owner of the small business concern identified below:
☒ an official of the small business concern empowered to act on behalf of the concern identified below:

NAME OF CONCERN Urethane Products International
ADDRESS OF CONCERN P. O. Box 218729, Houston, Texas 77218

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 13 CFR 121.3-18, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention, entitled PROTECTION OF PIPELINE JOINT CONNECTIONS by inventor(s) PAUL L. POOL AND WILLIAM H. GOWAN described in

- ☒ the specification filed herewith
☐ application serial no. _____, filed _____
☐ patent no. _____, issued _____

If the rights held by the above identified small business concern are not exclusive, each individual, concern or organization having rights to the invention is listed below* and no rights to the invention are held by any person, other than the inventor, who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person made the invention, or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d), or a nonprofit organization under 37 CFR 1.9(e).

*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

NAME _____
ADDRESS _____
☐ INDIVIDUAL ☐ SMALL BUSINESS CONCERN ☐ NONPROFIT ORGANIZATION

NAME _____
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☐ INDIVIDUAL ☐ SMALL BUSINESS CONCERN ☐ NONPROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF PERSON SIGNING _____
TITLE OF PERSON OTHER THAN OWNER _____
ADDRESS OF PERSON SIGNING _____

SIGNATURE Paul L. Pool DATE Aug. 6, 1996

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Applicant:	§	
	§	
PAUL L. POOL	§	
WILLIAM H. GOWAN	§	
	§	
Filed: OF EVEN DATE	§	Art Unit: 1306
	§	
Serial No. UNKNOWN	§	Examiner: Kuhns, A.
	§	
For: PROTECTION OF PIPELINE	§	
JOINT CONNECTIONS	§	
	§	Attorney Docket No.: D98020US

PRELIMINARY AMENDMENT

Commissioner of Patents
Washington, D.C. 20231

Dear Sir:

Please amend the above-identified patent application as follows:

IN THE CLAIMS

17. (AMENDED) A[n apparatus] cover for protecting exposed pipeline joint[s] sections on weight coated offshore underwater pipelines comprising:

a pliable cover material overlapping adjacent end portions of the weight coat, completely enclosing the exposed pipe joint section, and sealed in place forming an annular space around the pipe;

said annular space between the exposed pipeline and the cover material filled with a joint filling material.

18. (AMENDED) The [apparatus] cover of claim 17 wherein the joint filling material is a high density open celled polyurethane foam, formed by reacting polyurethane chemicals inside the cover material.

19. The [apparatus] cover of claim 17 wherein the pliable cover material is formed from polyethylene.

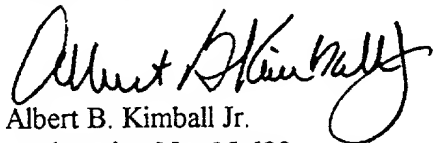
Please add claims 20-24.

20. The cover of claim 17, wherein said cover material includes an opening formed for injecting the joint filling material into said annular space.

21. The cover of claim 20, wherein the joint filling material is an open celled polyurethane foam capable of absorbing moisture to increase ballast of the pipeline.

22. The cover of claim 17, wherein the joint filling material is an open celled polyurethane foam capable of absorbing moisture to increase ballast of the pipeline.
23. The cover of claim 17, wherein the cover material includes a sheet of material wrapped in a cylindrical shape and having overlapping side edges sealed together to form said annular space.
24. The cover of claim 23, wherein the joint filling material is an open celled polyurethane foam capable of absorbing moisture to increase ballast of the pipeline.
25. The cover of claim 23, wherein the joint filling material is an open celled polyurethane foam formed by reacting polyurethane chemicals inside the cover material and capable of absorbing moisture to increase ballast of the pipeline.
26. The cover of claim 25, wherein said cover material includes an opening formed for injecting the joint filling material into said annular space.
27. The cover of claim 17, wherein the cover material is between about 0.02 inches to about 0.5 inches in thickness.

Respectfully submitted,

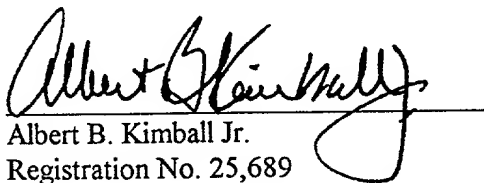


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CERTIFICATION UNDER 37 C.F.R. 1.10

I hereby certify that this correspondence is being deposited with the United States Postal Service as Express Mail in an envelope addressed to: Commissioner of Patents, Washington, D.C. 20231, on the 26 day of March, 1998.



Albert B. Kimball Jr.
Registration No. 25,689

APPLICATION FOR PATENT

INVENTOR: PAUL L. POOL
WILLIAM H. GOWAN

TITLE: PROTECTION OF PIPELINE JOINT CONNECTIONS

SPECIFICATION

Background of the Invention

1. Field of the Invention

This invention relates to pipeline joint protection. More specifically, the invention provides
5 a method and an apparatus for protecting exposed pipe joints on weight coated pipelines used in offshore applications.

2. Description of the Related Art

It has been a common practice in the offshore
10 pipeline industry to use weight coated pipe for pipelines which were to be located on ocean floors or other underwater surfaces. The weight coats traditionally used have been made of dense materials,
15 frequently concrete, applied several inches thick around the circumference of the pipe. The weight coats were to protect the pipeline and also to provide sufficient weight to maintain the pipeline submerged in a non-buoyant condition.

The weight coats usually have been applied to the full length of the pipe except for a short distance, usually about one foot from the end of each pipe section. The end portion of the pipe remained without
5 the weight coat to facilitate welding sections of the weight coated pipe together to make up the pipeline.

Sections of pipe have been placed on a barge and welded sequentially onto preceding sections forming a pipeline extending from the barge. The newly formed
10 pipeline was on rollers and as the barge moved forward, the pipeline would be carried over the rollers, lowered, and laid on the bed of the body of water.

The portions of the pipe without the weight coat had a corrosion coating applied to the surface of the
15 pipe to prevent the pipe from corroding due to exposure to the elements. Generally, the corrosion coatings used were heat shrinking tape or a fusion bonded epoxy. After the sections of pipe were welded together various techniques were used to protect the corrosion coating
20 on the exposed portions of pipe around each joint.

One technique was to wrap sheet metal over the weight coating adjacent the exposed portion of the pipe and band the sheet metal in place with metal bands. Generally, a 26 to 28 gauge zinc coated sheet metal was
25 used. The space between the pipe and sheet metal was then filled with a molten mastic which would solidify

as it cooled. However, in most cases, the pipeline had to be in a condition for handling immediately after the sleeves were filled so that the laying of the pipeline could proceed without delays. The mastic filling did
5 not set or harden to a sufficiently strong material within the required time to allow further processing of the pipe and the mastic would leech out into the water if the pipeline was lowered before the mastic was adequately cured.

10 An additional problem associated with this technique was that the banding used to hold the sheet metal in place, as well as the sheet metal itself, would corrode after the pipejoint was underwater for a period of time. Once the banding corroded, the sharp
15 ends of the sheet metal would come loose from the pipe. This created a particular problem in areas where commercial fishing was taking place. The sharp sheet metal ends would cut fishing nets which were being dragged over the pipeline by fishing trawlers. The
20 destruction of fishing nets by the loose sheet metal created severe financial problems for fishing industries. In some cases, corrosion resistance banding, such as stainless steel banding, was used to avoid this problem, but it was more expensive and also
25 subject to eventual failure.

Other techniques replaced the mastic filler with other types of materials. In the method disclosed in U.S. Patent No. 5,328,648, the exposed portion of pipe was covered with a mold which was then filled with a filler material. The filler materials were granular or particulate matter such as gravel or iron ore which would not pack solidly or uniformly. Elastomeric polyurethanes or polyureas were then injected into the mold in an attempt to fill the interstices between the granular fill materials. After the polymer components had reacted completely the mold would be removed from the surface of the infill.

This method could be difficult to use when the joint protection system was applied aboard the lay barge because the filler material, often gravel, had to be loaded and carried onto the barge. Additionally, there was often a lack of uniformity in the finished infill resulting from uneven polymer distribution in the filler material which created voids. Such voids could leave the corrosion coating exposed and subject to damage from fishing trawler nets or other objects moving through the water which might encounter the submerged pipeline.

Another technique, disclosed in U.S. Patent 4,909,669, involved wrapping the exposed portions of pipe with a thermoplastic sheet. The sheet overlapped

the ends of the weight coat adjacent the exposed joint and was then secured in place by screws, rivets, or straps. To increase the rigidity and impact resistance this joint protection system required the installation of reinforcing members such as plastic bars or tubes to the interior of the sheet. The reinforcement bars or tubes either had to be pre-cut and stored on the barge or else cut to the required fitting form as part of the installation process on the barge. This required additional handling and made the installation process more difficult.

Another method of reinforcing this joint protection system was to fill the lower portion of the annular space between the pipe and the plastic sheet with a material such as pre-formed foam half shells. When foam half shells were used in the lower portion of the annular space to provide support, the upper portion of the joint and the corrosion coating was in effect protected only by the plastic sheet enclosing the upper portion which had no foam covering. This could cause a particular problem if the pipelines were located where they would encounter the drag lines or trawler boards attached to the nets of fishing trawlers. The corrosion coating on the upper portion of the pipe joint could become damaged by this type of towed object.

An additional problem with this joint protection system occurred when pipelines were laid in shallow waters, i.e., less than about 200 feet deep. Pipelines in shallow waters were often buried by using high
5 pressure water jets which were directed at the ocean floor where the pipelines were to be buried. The water jets would wash out a trench into which the pipelines would be dropped for burial. The joint protection system could be damaged when the water jets came in
10 contact with the pipeline joint because the plastic sheet over the top of the pipejoint was not reinforced.

Summary of the Invention

The present invention provides a method and an apparatus for mechanically protecting exposed pipeline
15 joint sections. The method allows quick installation on lay barges where pipeline sections are welded together and does not require a long cure time before handling. The method for protecting exposed pipeline joint sections begins by forming a pliable sheet of
20 cover material into a cylinder which is fitted over the exposed portions of the joint connection. The longitudinal end portions of the pliable sheet of cover material overlap the adjacent edges of the weight
25 coating. Side edge portions of the sheet of cover material forming the cylinder are then overlapped

tightly such that an annular pocket is formed about the exposed joint section. The outside side edge is then sealed to the surface of the sheet of cover material, completely encasing the exposed pipe and the annular pocket or space. Polyurethane chemicals are then injected into the empty annular space where they react to form a high density foam which fills the annular space. Other polymerizing or hard setting fluid compounds such as marine mastics, quick setting concretes, polymers, or elastomeric compounds may also be used to fill the empty annular space.

The present invention provides the joint section of an underwater pipeline with mechanical protection and abrasion resistance that is not subject to corrosion problems, will not damage fishing nets, and will not be damaged by water jets used for pipeline burial.

Brief Description of the Drawings

A better understanding of the invention can be obtained when the detail description set forth below is reviewed in conjunction with the accompanying drawings, in which:

Figure 1 is a depiction of two sections of weight coated pipe which have been joined by welding;

Figure 2 is a pliable sheet of cover material formed in a cylinder which is used to enclose the exposed joint section;

5 Figure 3 is a longitudinal view, showing the pliable sheet of cover material wrapped and sealed around the exposed joint section;

Figure 4 is a longitudinal cross section showing the joint section after the joint protection system has been applied.

10

Description of Preferred Embodiment

Fig. 1 shows a pipeline 10 formed by welding together two pipe sections 12 & 12A each of which are covered by a weight coat 14 & 14A, respectively. The weight coat 14 & 14A, which is formed from concrete or other suitable materials, completely covers the pipe sections 16 & 16A circumferentially and longitudinally except for a portion of each pipe end 18 & 18A of the pipe section 16 & 16A. The pipe ends 18 & 18A are left exposed to facilitate welding of the two pipe sections 12 & 12A together as sections of a pipeline. However, these exposed pipe ends 18 & 18A leave gaps of pipe not coated with weight coat in the pipeline 10, which are covered only by a corrosion coating 24.

25 The method of the present invention begins with installing a cover material 30 which is used to enclose

and provide structural protection for the exposed corrosion coating 24 on the pipe end 18 & 18A. As shown in Fig. 2, the preferred method uses a cover material 30 which is pliable, but strong, and can be formed into a cylindrical shape. The preferred cover material 30 is formed from high density polyethylene, however, other thermoplastic materials may be used. The pliable cover material 30 should be at least about 0.02 inches thick and may be considerably thicker if a stronger support and impact resistance is desired. Water depth, pipe size, pipe weight and other factors may dictate the use of a cover material 30 which is up to about 1/2 inch in thickness. The cover material 30 may be a flat sheet or may be preformed into a cylindrical shape.

The pliable sheet of cover material 30 is wrapped into a cylindrical shape around the exposed pipe ends 18 & 18A such that the inside diameter of the cylinder of cover material 30 is about the same as the outside diameter of the weight coat 14 & 14A on the pipeline 10. The cover material 30 should be long enough to overlap the adjacent edges 22 & 22A of both sides of the weight coating 14 & 14A by several inches to allow the weight coating 14 & 14A to act as a structural support for the cover material 30. Once the cover material 30 is fitted over the adjacent edges 22 & 22A

of the weight coat 14 & 14A, the side edges 34 and 36 of cover material 30 are tightly pushed together such that the side edges 34 & 36 overlap. The cover material 30 can be tightened down and held in place with cinch
5 belts. The outside edge 34 is then sealed to the surface of the cover material 30 and a sealed sleeve 40 is formed.

The cover material 30 can be sealed by plastic welding the outside edge 34 onto the surface of the
10 cover material 30, forming a longitudinally extending plastic weld the entire length of the cover material 30 as shown in Fig 3. Other means of sealing such as heat fusion, riveting, gluing, taping, or banding can also be used to seal the cover material 30.

15 The sealed cover material sleeve 40 forms a protective barrier around the exposed portion of pipe 18 & 18A which remains as a permanent part of the pipeline 10. An annular space 44 is formed around the pipe 18 & 18A by installing the cover material sleeve
20 40. This annular space 44 is filled by first cutting a hole 38 in the sealed cover material sleeve 40 and thereafter injecting fluid joint filler system components through the hole 38 and into the annular space 44.

25 The hole 38 may be drilled or cut or otherwise made in the sealed cover material sleeve 40 to

thereafter allow unreacted joint filler system components to be injected into the annular space 44. The hole 38 may be precut into the cover material 30 prior to installation on the weight coated pipeline 10 or may be cut after the sealed cover material sleeve 40 is in place. The diameter of the hole 38 to be drilled is dependent upon the particular type of mixing head used to inject the joint filler system components. Industry standard or conventional injection heads are acceptable.

In the preferred method, the annular space 44 is filled with a high density foam by injecting components for a rapid setting polyurethane system through the hole 38 with a mixing head. The polyurethane foam 52 serves as a shock absorber and protects the corrosion coating on the pipe 18 & 18A. Also, because the foam 52 is open celled, it can absorb water and increase the ballast effect for the pipeline 10. Alternatively, other polymerizing or hard setting compounds such as marine mastics, quick setting concretes, polymers, or elastomeric compounds may be used to fill the empty annular space. Preferably, any alternative filler material is quick hardening, such that the process of laying the pipeline is not inhibited.

The preferred polyurethane system used to form the protective high density foam 52 in this process is a

combination of a isocyanate and a polyol system which
when reacted rapidly cures and forms high density open
celled polyurethane foam which resists degradation in
sea water. The preferred isocyanate is a polymeric
5 form of diphenylmethane diisocyanate as manufactured by
Bayer Corp. The preferred polyol system is a mixture
of multifunctional polyether and/or polyester polyols,
catalysts for controlling the reaction rate,
surfactants for enhancing cell formation, and water for
10 a blowing agent. Acceptable blended polyol system are
manufactured by Dow Chemical Co., Bayer Corp., and
others.

The preferred polyurethane system produces a foam
with a density of about 8 to 10 pounds per cubic foot
15 and has about eighty percent or greater open cells.
The compressive strength of the preferred polyurethane
foam is approximately 150 psi or greater at 10 percent
deflection and 1500 psi or greater at 90 percent
deflection. Reaction of the preferred polyurethane
20 system components can be characterized by a 15 to 20
second cream time, the time between discharge from the
mixing head and the beginning of the foam rise, a 40 to
50 second rise time, the time between discharge from
the mixing head and the complete foam rise, and a 180
25 to 240 second cure time, the time required to develop
the polymer strength and dimensional stability.

The cover material sleeve 40 acts as a mold and holds the foam 52 in place until it is completely cured. As shown in Figure 4, this polyurethane foam 52 completely fills the annular space 44 without leaving significant void areas. No additional filler materials are needed to be used in conjunction with the polyurethane foam 52. The polyurethane foam 52 should completely fill the annular space 44 and protrude to some extent upward through the hole 38 on the sealed cover material sleeve 40.

Fig. 4 shows the completed protective covering of the joint protection system according to the present invention. The sealed cover material sleeve 40 together with the polyurethane foam 52 provide a protective system which protects the exposed pipe 18 & 18A and the corrosion coating 24 during handling and laying of the pipeline 10 and continues to provide protection from damage due to drag lines or trawler boards attached to fishing trawler nets. Further, the sealed cover material sleeve 40 is not subject to the corrosion problems of prior art systems and therefore does not create a underwater hazard or a danger to fishing nets. Additionally, the protective system provided by the present invention acts to deflect the high pressure water jets used to bury pipelines in shallow waters which have resulted in damage to the

corrosion coating on pipe joints protected by prior art systems.

From the foregoing, it can be seen that the present invention provides a method and apparatus for protecting the corrosion coating 24 on exposed pipeline joints such as 12 & 12A on weight coated pipelines 10 used in offshore applications. The method allows quick installation on a lay barge where pipeline sections are being welded together for offshore installation. The corrosion coating 24 on the pipeline joint connections 18 & 18A which have no weight coating is protected by forming a pliable sheet of polyethylene into a cylindrical cover material sleeve 40 over the pipeline joint connection. Polyurethane chemicals are used to react and form a high density foam 52 which fills the annular space 44 between the pipe 18 & 18A and the cover material sleeve 40. The cover material sleeve 40 and the foam 52 work together to protect the joint connection.

It should be understood that there can be improvements and modifications made of the embodiments of the invention described in detail above without departing from the spirit or scope of the invention as set forth in the accompanying claims.

25

CLAIMS

What is claimed is:

- 1 1. A method for protecting exposed joint
2 connection portions on weight coated pipelines
3 comprising the steps of:
4 installing a cover material around the
5 exposed joint connection such that the cover material
6 overlaps the weight coating on either side of the
7 exposed joint connection,
8 cutting an opening into the cover material,
9 sealing cover material together forming an
10 annular void between the pipe and the cover material,
11 injecting fluid joint filler system
12 components through the opening into the annular void,
13 and
14 allowing the joint filler system to solidify
15 and fill the void.
- 1 2. A method of claim 1 wherein the fluid joint
2 filler system is a rapid setting polyurethane system.
- 1 3. A method of claim 1 wherein the cover
2 material is a pliable sheet of synthetic resin.
- 1 4. The method of claim 3 wherein said step of
2 installing comprises the step of:

3 forming the resin sheet into a cylinder
4 forming an annular pocket about the exposed joint
5 connection.

1 5. The method of claim 4 wherein the cover
2 material is sealed by heat welding.

1 6. The method of claim 4 wherein the cover
2 material is a thermoplastic synthetic resin.

1 7. The method of claim 4 wherein the cover
2 material is polyethylene..

1 8. The method of claim 4 wherein the cover
2 material is between about 0.02 inches to about 0.5
3 inches in thickness.

4 9. The method of claim 4 wherein the opening is
5 precut into the cover material.

1 10. The method of claim 4 wherein the joint
2 filler system is a rapid curing polyurethane system
3 which reacts to form a high density open celled foam
4 material in the annular void.

1 11. A method for protecting exposed joint
2 connection portions on weight coated pipelines
3 comprising the steps of:
4 installing a synthetic resin cover material
5 around the exposed joint connection by forming the
6 resin sheet into a cylinder which overlaps the weight
7 coating on either side of the exposed joint connection
8 forming an annular pocket about the exposed joint
9 connection,
10 sealing the cover material together forming a
11 sleeve,
12 cutting an opening into the cover material,
13 injecting a mixture of unreacted polyurethane
14 chemicals through the opening into the annular void,
15 and
16 allowing the polyurethane chemicals to react
17 and completely fill the void.

1 12. The method of claim 11 wherein the outside
2 edge of the cover material is sealed to the cover
3 material by heat welding.

1 13. The method of claim 11 wherein the cover
2 material is a thermoplastic synthetic resin.

1 14. The method of claim 11 wherein the cover
2 material is polyethylene.

1 15. The method of claim 11 wherein the cover
2 material is between about 0.02 inches to about 0.5
3 inches in thickness.

4 16. The method of claim 11 wherein the opening is
5 precut into the cover material.

1 17. An apparatus for protecting exposed pipe
2 joints on weight coated pipelines comprising:
3 a pliable cover material overlapping adjacent
4 end portions of the weight coat, completely enclosing
5 the exposed pipe joint, and sealed in place forming an
6 annular space around the pipe;
7 said annular space between the exposed
8 pipeline and the cover material filled with a joint
9 filling material.

1 18. The apparatus of claim 17 wherein the joint
2 filling material is a high density open celled
3 polyurethane foam, formed by reacting polyurethane
4 chemicals inside the cover material.

- 1 19. The apparatus of claim 17 wherein the pliable
- 2 cover material is formed from polyethylene.

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ABSTRACT

A method and apparatus for protecting exposed pipeline joints on weight coated pipelines used in offshore applications. The method allows quick installation on a lay barge where pipeline sections are being welded together for offshore installation. The method does not require a long cure time before handling. The method protects the corrosion coating on pipeline joint sections not covered with weight coat by forming a pliable sheet of polyethylene into a cylindrical cover material sleeve over the exposed pipeline joint connection. Polyurethane chemicals are reacted to form a high density foam which fills an annular space between the pipe and the cover material sleeve. The cover material sleeve and the foam form a composite system to protect the joint connection whereby the foam provides continuous compressive reinforcements and impact resistance and the sleeve provides puncture resistance and protection from water jetting/post trenching operations plus abrasion resistance.

FIG. 1

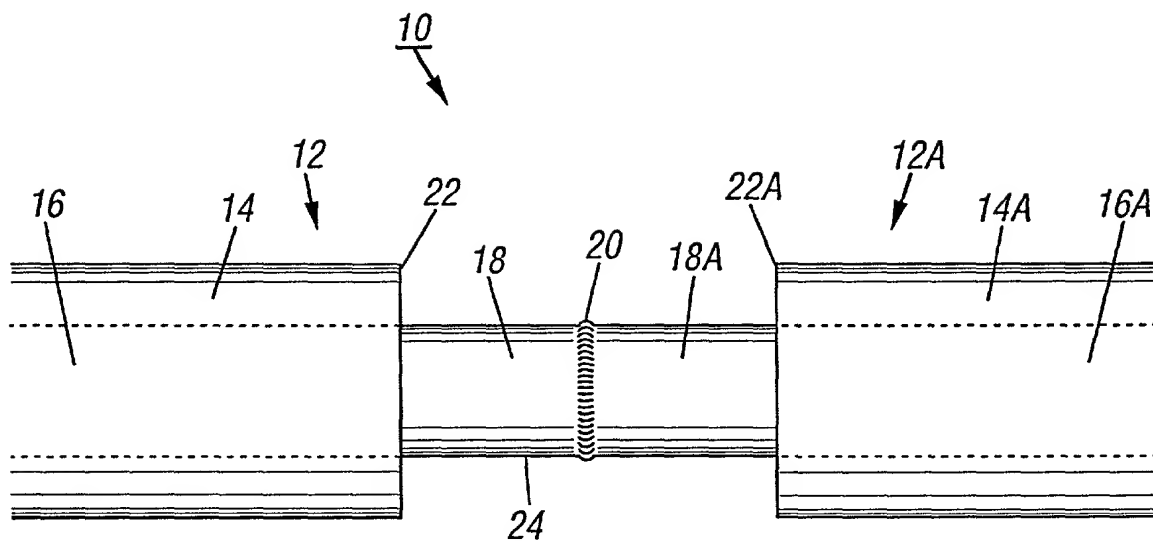


FIG. 2

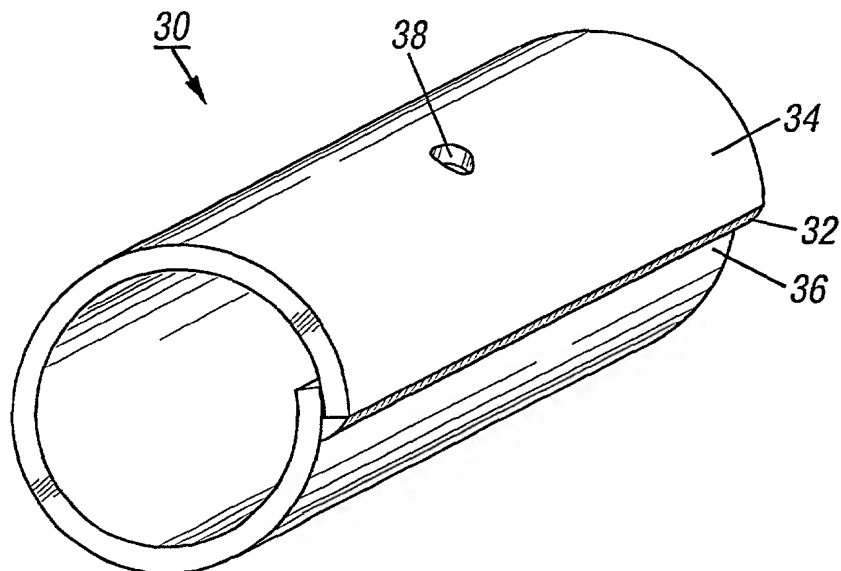


FIG. 3

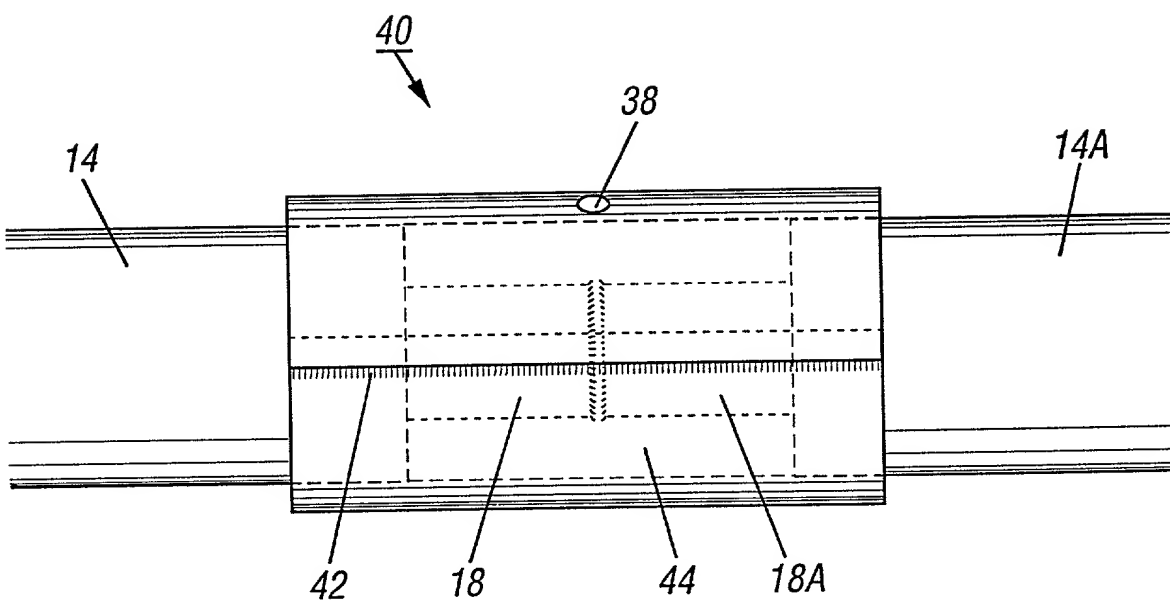
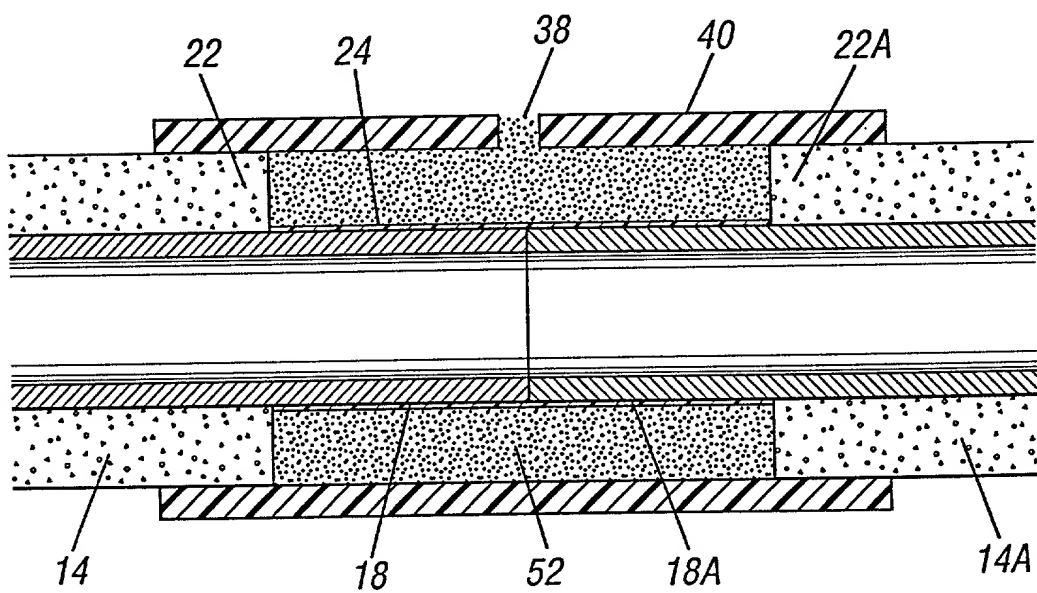


FIG. 4



DECLARATION**SOLE/JOINT INVENTOR**
ORIGINAL/SUBSTITUTE INVENTOR

As a below named inventor, I hereby declare that: my residence, post office address, and citizenship are as stated below next to my name. I believe I am the original, first, and sole inventor (if only one name is listed below) or a joint inventor (if plural inventors are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

PROTECTION OF PIPELINE JOINT CONNECTIONS

as described in the specification [X] attached or [] of patent Application Serial No. _____, filed _____

and amended on _____

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above; that I do not know and do not believe the same was ever known or used in the United States of America before my or our invention thereof, or patented or described in any printed publication in any country before my or our invention thereof or more than one year prior to this application; that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representative or assigns more than twelve months prior to this application; and that I acknowledge the duty to disclose information of which I am aware which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations § 1.56(a). Such information is material when it is not cumulative to information already of record or being made of record in the application, and

(1) it establishes, by itself or in combination with other information, a prima facie case of unpatentability of a claim; or

(2) it refutes, or is inconsistent with, a position the applicant has taken or may take in:

(i) opposing an argument of unpatentability relied on by the Office, or

(ii) asserting an argument of patentability.

I hereby claim foreign priority benefits under Title 35, United States Code § 119 of any foreign application(s) for patent or inventor's certificates listed below and have also identified below any foreign application(s) having a filing date before that of the application(s) on which priority is claimed:

COUNTRY	APPLICATION NUMBER	DATE OF FILING	PRIORITY CLAIMED UNDER 35 USC 119
			<input type="checkbox"/> YES <input type="checkbox"/> NO
			<input type="checkbox"/> YES <input type="checkbox"/> NO

I hereby claim the benefit under Title 35 United States Code § 120 of any United States application(s) listed below and, insofar as any subject matter of any claim of this application is not disclosed in the prior United States Application, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations § 1.56(a) which occurred between the filing date of the prior application and the national PCT international filing date of this application:

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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